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(54) Abstract Title
Inflatable seal

(57) A watertight door or window fitting A1 comprising a seal 5 with a tubular chamber, a feed line, a valve 6 and a compressed air supply 7. The seal is positioned around the perimeter of an outer frame next to a rim 11 which opposes a mobile frame 2. The rear part of the seal may be inserted into a channel to the side of the rim, whilst the front part of the seal may include an inflatable chamber having a lip type form and sitting against the rim. Alternatively the seal may have grooves in its base such that it fits a longitudinal seat in the rim. The valve may be a two way type valve and may work in conjunction with a water sensor 8.

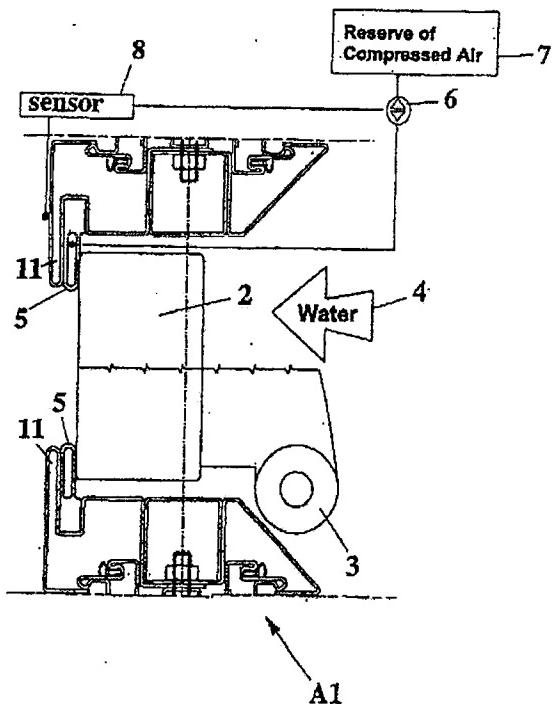


FIG. 1

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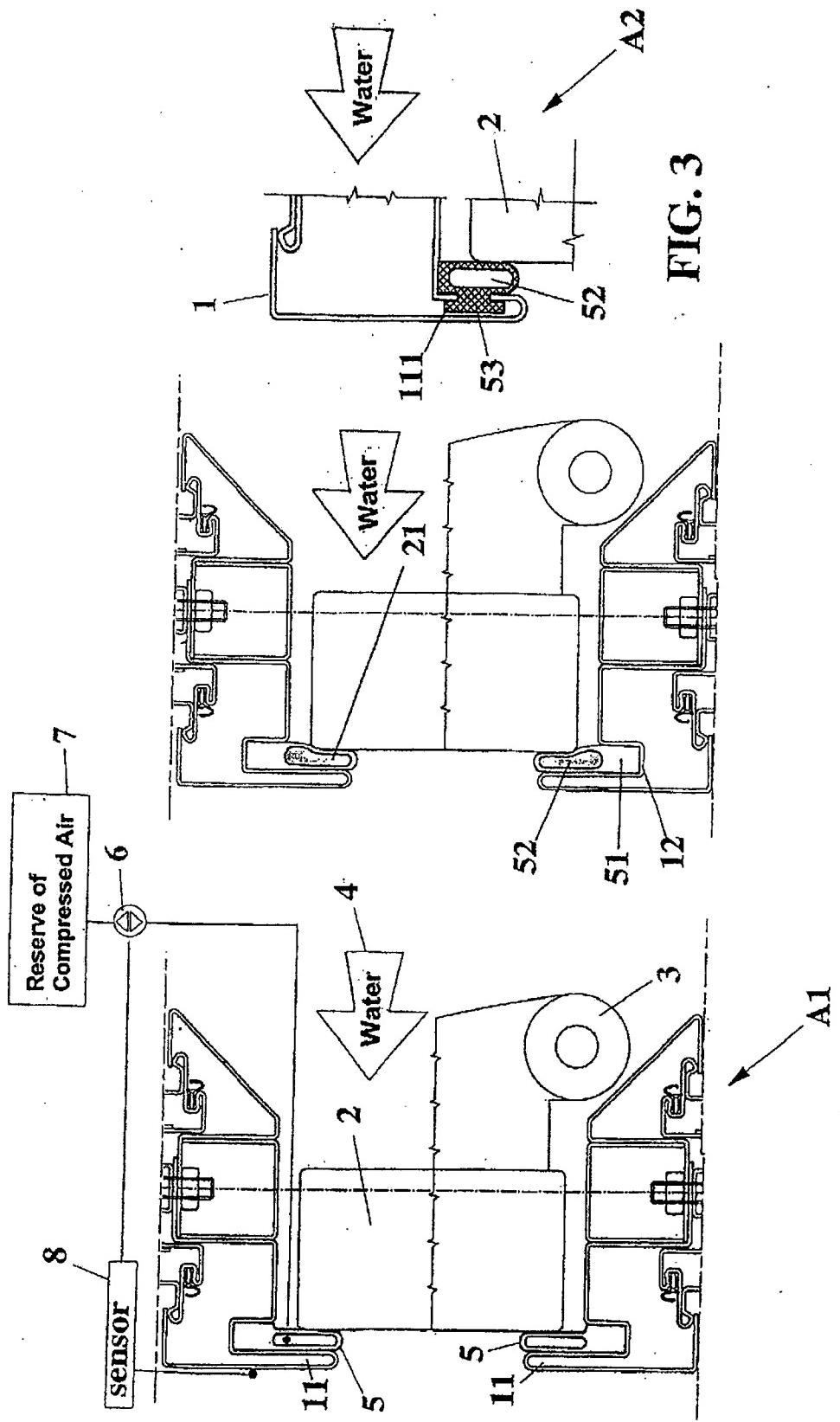


FIG. 1
FIG. 2
FIG. 3

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5 **WATERTIGHT DOOR OR WINDOW FITTING, PARTICULARLY FOR
CIVIL USE**

This invention relates to a watertight type door or window fitting.

- 10 The invention is to be used particularly, but not exclusively, in the sector involved with the dressing of buildings, either new constructions or pre-existing buildings subject to maintenance interventions.

15 **FOREWORD**

Door and window fittings for buildings are well known. Their main aim is to keep the internal temperature of the building at an optimum level, whatever the climatic conditions on the outside.

- 20 One of the main functions of the companies involved in this activity is, therefore, to guarantee that the windows and doors offer efficient protection against thermal variations, that is to say, to construct a barrier against inclement weather. However, if on the
25 one hand the door and window fittings generally used today

1 offer efficient protection against temperature variations and
2 against the wind, they are not as efficient, or are certainly less
3 efficient, against water entering into the building. This is not true in
4 the case of rainwater, since it is a spasmodic event and because
5 the quantity of water which hits against the door or window is
6 relatively small, especially in those cases where the doors or
7 windows are located in areas or recesses which are more or less
8 always protected. On the other hand, there is not sufficient
9 protection in those cases, albeit less frequent, in which the buildings
10 are hit by natural disasters such as floods or other such events,
11 such as high tides which occur in nearby Venice.

12 It appears quite clear, therefore, that door and window
13 fittings currently used and installed in buildings are insufficient in
14 guaranteeing that water does not leak or seep through them, or
15 even leak or seep around their sides if we take into consideration
16 the size of the gaps around the doors and windows due to
17 irregular jointing surfaces. Even the most advanced types of seals
18 available are unable to solve the problem, since the pressure
19 exerted on them is proportional to the depth of the water. As a
20 result, since the events considered may be quite violent, such as
21 river floods, the amount of water involved is so high that any
22 traditional barrier or protection will be inadequate.

23 There are a number of solutions which may be adopted to
24 avoid water leaking into the building. One such example is
25 US3861081 (Maskell), which employs a «U»-shaped frame which is

1 fixed to the walls on the outside of the building, in this case the
2 sides of the lower part of a door. The said frame is made up
3 basically of «U»-shaped straight segments with sealing means,
4 which guide and hold in place a panel of impermeable material
5 inserted from above as and when required and which, once the
6 emergency is over, may be easily removed. The solution described is
7 not very practical, both for the limit in height of the panel and for
8 its functionality and appearance.

9 In 1980, the Belgian patent BE0882294 (S.t.r.v.) proposed a highly-
10 efficient solution for insulation purposes, to be used for doors,
11 windows and other fittings. From a practical point of view, there is
12 a seat around the perimeter of the framework which fits into the
13 hole where the fitting is to be installed, with a tubular seal similar to
14 an inner-tube inside the said seat. The said seat and seal couple
15 against the edge of the framework of the mobile part of the fitting
16 so that, when it is closed, and as and when required, a fluid may be
17 injected into the inner-tube, with the pressure of the fluid gradually
18 expanding the seal until it presses against the edge of the closed
19 mobile part.

20 This solution, even though it is more efficient than the
21 previous one, has certain limits which, to sum up briefly, are its
22 insufficient sealing properties due to the fact that it is the profile of
23 the expanded tubular portion which presses against edge of the
24 framework of the fitting when it is in a closed condition. When there
25 is a large amount of water to be held back, leaking is still a

1 problem, which causes considerable damage on the inside of the
2 building, and above all the solution is not suitable for other uses. A
3 further development is described in patent N° FR2723137 (Berard),
4 in which a shaped profile in rubber is placed between the tubular
5 seal and the edge of the framework of the fitting against which the
6 mobile part is closed. In this example, the said profile is shaped on
7 one side in order to hold the inflated tubular element and is flat on
8 the other, with this latter side which presses against the perimeter
9 of the framework. More recent solutions, such as GB2333118
10 (MacLean), use the same concept as FR2723137 (Berard), which
11 attempts to guarantee a more efficient seal by working on the
12 conformation of the tubular seal, which in this case does not have
13 the element in rubber, and presses with a pyramidal, protruding rim
14 against the framework.

15 Amongst the most noteworthy solutions, there are also
16 proposals which use the concept of a device to inflate an inner-tube
17 located around the perimeter of the window or door fitting. This is
18 the case with US4706413 (James) which operates in conjunction
19 with a sensor, in this case a smoke detector, which sends a signal
20 to a supply of compressed air if smoke is detected, and which
21 inflates the inner-tube located around the perimeter of the said
22 door or window fitting.

23 THE MOST RECENT PRECEDENTS

24 In DE19615055 (Winiger), there is the description of a fitting
25 for sealing purposes, similar to the one described above, which has

1 an inflatable, tubular element located around the perimeter of the
2 fitting, and which is in contact with the sides of the opening made in
3 the wall. Going further into detail, the said fitting has a frame-type
4 rim which faces the outside and which, when the fitting is in a closed
5 condition, overlaps the external side of the wall in correspondence
6 with the opening. As a result, the inflatable, tubular element is
7 alongside the said rim and, when it is pressurised, it presses against
8 the sides of the opening and against the internal side of the rim.

9 In the European patent N° EP0731245 (Schmitz), there is the
10 description of a similar solution. The main difference is that the
11 tubular, sealing element, which is located around the perimeter of
12 the fitting, only presses against the edge facing the framework.
13 Furthermore, it is located at a certain distance from the rim, which
14 simply overlaps the wall, along the edge of the opening for the
15 fitting.

16 In GB2342377 (Price), there is a proposal to include a
17 container of compressed air, which may be connected by means of
18 two inflatable, tubular elements located around the fitting.

19 Finally, in DE3329829 (Leu), the major difference is that the
20 slot for the inflatable, tubular element is located in the framework
21 for the fitting itself, rather than in the outer framework. Also, the
22 said tubular element has a fitting with a valve, to be connected to a
23 container for compressed air. The said valve is controlled by a
24 sensor which detects the presence of water, and which is positioned

1 close to the window or door fitting, on the outside face where it is
2 installed.

3 DRAWBACKS

4 The drawbacks, with reference to the solutions described
5 above, are as follows.

6 Firstly, door and window fittings currently used for civil
7 purposes need to be optimised to avoid that, when necessary, and
8 also in conditions such as high pressure, water may leak through.
9 The sealing of the said fittings relies entirely upon the tubular seal
10 which inflates when injected with fluid under pressure. As a result,
11 because the seal is directly subject to pressure in a number of
12 points, it is often insufficient to guarantee a tight seal. This
13 drawback is even more felt if the pressures which such systems
14 may have available is taken into consideration. Going further into
15 detail, since only a low pressure is used to keep the inner-tube
16 inflated, it is particularly vulnerable, since a change in the depth of
17 the water or the force of the water which laps against the fitting
18 may be sufficient to lead to seal failure.

19 For this and other reasons, alternative proposals must be
20 singled out which, at the same time, represent a technical progress
21 compared with the solutions currently available.

22 BRIEF DESCRIPTION OF THE INVENTION

23 These and other aims are achieved by means of this invention
24 according to the characteristics in the attached claims, by solving
25 the problems described by means of a watertight door or window

1 fitting for civil use, which includes a container with a reserve of
2 compressed air. The said container, in conjunction with a valve
3 positioned along the line and with a sensor to detect the presence
4 of water, is connected to at least one seal with a tubular chamber.
5 The said seal is positioned around the perimeter of the outer
6 framework, against which the mobile framework of the fitting, which
7 opens only towards the outside of the building, closes.

8 ADVANTAGES

9 In this way, through the creative contribution of the system,
10 which leads to an immediate technical progress, various
11 advantages are achieved.

12 With reference to the state of the art, and compared with
13 proposal N° US3861081 (Maskell), the water-tightness of the fitting
14 does not depend on the height of the panel and, since it does not
15 use the panel concept, it is more functional and more attractive.

16 As far as the Belgian patent BE0882294 (S.t.r.v.), patent
17 FR2723137 (Berard) and patent GB2333118 (MacLean) are
18 concerned, this proposal optimises the water-tightness by
19 combining the action of an inflatable seal with the mechanical
20 resistance of the rim on the outer framework against which the
21 mobile framework closes. From a practical point of view, this
22 results in an increase in the efficiency of the seal, which adapts itself
23 according to the amount of water present on the outside.

24 As far as US4706413 (James), DE19615055 (Winiger),
25 EP0731245 (Schmitz), GB2342377 (Price), and DE3329829 (Leu)

1 are concerned, the main difference with the solution proposed is the
2 position of the rim, which means that the mobile framework may
3 only be opened towards the outside, and the position of the seal,
4 which is positioned close to the rim. This leads to a more efficient
5 sealing against water leakage, and they work in conjunction with the
6 system which detects the presence of water on the outside and
7 which communicates with the fluid-feed system to guarantee a
8 rapid intervention.

9 These and other advantages are anything but negligible, and
10 lead to a product which is manufactured with a high level of
11 technology, which is functional and extremely reliable, especially
12 under adverse conditions.

13 Other advantages will be shown in the following detailed
14 description and drawings of a preferred application of the system,
15 the particulars of which are to be considered merely an example,
16 and not a limitation.

17 CONTENTS OF THE DRAWINGS

18 Fig. 1 is a transversal, sectional outline of a watertight fitting
19 under static conditions, in conjunction with a water-detection
20 system which activates the fluid-feed device.

21 Fig. 2 is another transversal, sectional view of the fitting
22 illustrated in Fig. 1, in a simplified, operational condition.

23 Fig. 3 is another transversal, sectional view of a second type
24 of fitting, but without the water-detection system which activates

1 the fluid-feed device, and with a different position and conformation
2 of the inflatable seal.

3 DESCRIPTION OF AN APPLICATION OF THE INVENTION

4 This solution refers to a watertight door or window fitting,
5 particularly for civil use. Going into detail, a fitting of type (A1, A2)
6 is made up of an outer frame (1) which is fixed to a wall around the
7 perimeter of the opening to be sealed off. On one side of the said
8 outer frame (1), there is a symmetrical rim similar to a frame (11),
9 positioned so that it protrudes towards the inside of the building.

10 In this case, on the external side of the fitting (A1, A2), there
11 is the mobile part or frame (2) of the fitting. It has at least one
12 hinge (3) and opens outwards only, that is, against the pressure of
13 the water (4) that may be present. When the said frame (2) is in a
14 closed position, its edge (21) presses in correspondence with at
15 least one seal, which has a closed, tubular chamber (5) which may
16 be inflated. In this case, the seal (5) is positioned between the
17 internal side of the rim (11) of the outer frame (1) and the said
18 edge (21) of the frame, in order to guarantee at least a minimum
19 sealing effect, even if no fluid has been injected into it.

20 Regarding the conformation of the seal with the inflatable
21 chamber (5), in the fitting (A1) proposed, there is a portion on one
22 side (51) for fixing it to the outer frame (1). In this case, there is a
23 channel (12) towards the inside of the outer frame (1) and
24 alongside the rim (11), where the rear portion (51) of the seal (5)
25 is inserted. The front portion (52), which has a lip-type formation

1 sticking out, sits up tight against the rim (11), and is connected to
2 a reserve of compressed air (7) by means of a valve (6) positioned
3 along the feed line. In one case, the reserve of compressed air (7)
4 consists of a container located inside the outer frame (1) or in a
5 dedicated space in the wall, so that it may be easily inspected.

6 Finally, there is a sensor (8) located outside the fitting (A1,
7 A2), which is used to detect the presence of water (4). The said
8 sensor (8) is connected to the valve (6), and when the said sensor
9 (8) detects the presence of water (4), it sends an impulse to the
10 valve (6) so that, when it opens, the pressurised air held in the
11 container (7) flows into the chamber in the front portion (52) of
12 the seal (5). The seal (5) expands, so that it presses uniformly
13 against the edge (21) of the frame (2). At the same time, the
14 pressure of the water itself, which presses the mobile frame (2)
15 against the seal (5) and against the rim (11) of the outer frame
16 (1), helps to increase the efficiency of the seal.

17 Fig. 2 illustrates the same fitting as in Fig. 1, but with the seal
18 (5) in operating conditions. In particular, this shows the case in
19 which the sensor (8) or other detection means, or even by means
20 of a manual intervention, the presence of water has been detected
21 which, as described previously, sends an impulse to the valve (6).
22 When the barrier is no longer required, the chamber (52), by taking
23 up its original shape, sends the air contained inside back through
24 the valve (6), which is a two-way type, and towards the container
25 (7).

1 In the solution illustrated in Fig. 3, there is a second proposal
2 for a fitting. Going into detail, compared with the first proposal, the
3 fitting (A2) has the seal (5) with the inflatable chamber (52) in a
4 different position. In this case, the rim (11) is formed in a different
5 way on the internal side, in order to create a longitudinal seat (111)
6 where the seal (5) may be inserted and held in place. In this case,
7 the seal (5) has a base (53) with a groove on each side, into which
8 the longitudinal edges of the opening (111) are fitted.

9 Finally, in a preferred solution, the fitting, which may be either
10 type (A1) or type (A2), is made in such a way that the seal (5)
11 may be inflated continuously and independently from the presence
12 of water on the outside. Going further into detail, the chamber (52)
13 of the seal (5) is injected with fluid, for example with compressed
14 air, every time that the frame (2) is closed against the outer frame
15 (1). In this way, the fitting no longer requires any kind of sensor (8)
16 to detect the presence of water, thus keeping the inside of the
17 building watertight.

CLAIMS

- 5 1. A watertight door or window fitting for civil use comprising a container which holds a reserve of compressed air and which, by means of a valve positioned along the feed line, is connected to a seal with a tubular chamber positioned around the perimeter of an outer frame, and wherein the seal is positioned next to a rim which is
10 opposite to a mobile frame of the fitting which opens only towards the outside.
2. A watertight door or window fitting for civil use according to claim 1, wherein the rim of the fitting is positioned on the side which faces the inside of the space which is to be protected.
- 15 3. A watertight door or window fitting for civil use according to claim 1 or claim 2, wherein the outer frame has a channel to the side of the rim, where a rear part of the seal is inserted, while a front part of the seal, which includes an inflatable chamber, has a lip-type form which sits against the rim.
- 20 4. A watertight door or window fitting for civil use according to claim 1 or claim 2, wherein the rim, in correspondence with the side which faces the inside of the fitting, has a longitudinal seat in which the seal may be inserted and held in place, the seal having a base with grooves into which longitudinal edges of the longitudinal seal
25 are fitted.
5. A watertight door or window fitting for civil use according to any preceding claim, wherein the valve is of a two-way type.
6. A watertight door or window fitting for civil use according to any preceding claim, wherein the valve works in conjunction with a
30 sensor means which detects the presence of water.

7. A watertight door or window fitting, particularly for civil use, substantially as described herein with reference to Figures 1 and 2 of the accompanying drawings.
8. A watertight door or window fitting, particularly for civil use,
5 substantially as described herein with reference to Figures 1 and 2 as modified by Figure 3 of the accompanying drawings.



Application No: GB 0203051.8
Claims searched: 1-8

Examiner: Ben James
Date of search: 20 June 2002

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.T): E1J: JGN, JGM

Int Cl (Ed.7): B63B: 19/00, 43/32
E06B: 7/18, 7/23, 9/00

Other: ON-LINE: EPODOC, WPI, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
Y	GB 2216163 A	Brian Christopher Allport (Figure 2)	Y: 3, 4
Y	GB 2113283 A	Kawneer Company Inc. (Figure 5)	Y: 3, 4
X, Y	GB 1342190 A	Ferma Aug. Winkhaus (Figure 1)	X: 1, 2 Y: 3, 4
Y	GB 1290340 A	Bernard Dixon & Partners Ltd. (Figure 5)	Y: 3, 4
X, Y	DE 3329829 A	Leu, Siegfried (Figure 1)	X: 1, 2, 5, 6 Y: 3, 4

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
& Member of the same patent family		E	Patent document published on or after, but with priority date earlier than, the filing date of this application.